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BIOLOGICAL EVALUATION OF SOUTHERN PINE BEETLE ON THE MENA, CADDO, COLD SPRINGS, POTEAU, WOMBLE, AND ODEN DISTRICTS OF THE OUACHITA NATIONAL FOREST

by

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Abstract

A biological evaluation of southern pine beetle (SPB) was conducted on the Mena, Caddo, Cold Springs, Poteau, Womble, and Oden Districts of the Ouachita National Forest in Arkansas. During August 1983, these districts had an estimated 190 active SPB spots; 211,939 acres of susceptible host type and a cumulative average of 0.88 SPB spots/1000 acres of susceptible host type in the outbreak area. Most infestations were expanding and there was a positive ratio of green infested trees (green tree:red tree ratio of 2.10:1). Forest Pest Management recommends that a SPB suppression project be initiated for FY 84 for these districts.

INTRODUCTION

A biological evaluation was conducted on the Mena, Caddo, Cold Springs, Poteau, Womble, and Oden Districts of the Ouachita National Forest to determine the status of southern pine beetle (Dendroctonus frontalis Zimm.) populations. Entomologists from Forest Pest Management (FPM), Alexandria, LA, Field Office conducted the evaluation from August 15 through September 1, 1983.

During FY 1983, the Caddo and Mena Districts had a SPB suppression project. The Caddo District exceeded its salvage target before June 1, 1983.

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Although the number of SPB infestations on the Caddo and Mena Districts have declined, it is probably due to the aggressive salvage program these districts have pursued and not a less vigorous SPB population.

METHOD OF EVALUATION AND ANALYSIS OF SPB INFESTATIONS

Aerial Survey and Ground Check

Standard aerial sketch map procedures were used for this evaluation, except survey coverage was 100%. Aerial surveys were conducted by district personnel prior to ground checking and spots of red and/or fading trees were recorded and plotted on Forest Service Class A maps. Forty-five spots were randomly selected for ground checking.

Numbers of vacated and infested trees, crown color, brood stage, basal area, age, height, DBH, percentage of the stand in sawtimber, and landform were recorded. This information was used to run the benefit/cost analysis, the Arkansas SPB spot growth model, and to hazard rate the stands.

Hazard Rating

All the SPB infested stands were hazard rated at the time of ground checking. The system used was developed by Dr. Peter Lorio of the Southern Forest Experiment Station. It is designed for use by the National Forests in Region 8 and utilizes field data collected by the prescriptionist during the field procedure for compartment prescriptions.

Suppression Project Criteria

Decisions to initiate a SPB suppression project were based on the following criteria:

- Number of SPB spots per 1,000 acres of susceptible host type.

  This figure provides an indication of current levels of SPB activity. One multiple tree spot/1000 acres of susceptible host type has historically been considered the lower threshold of a SPB epidemic. To determine the number of acres of susceptible host type, the Continuous Inventory of Stand Conditions (CISC) data for the Ouachita National Forest was used. The number of acres of shortleaf-oak, loblolly-hardwood, loblolly, shortleaf, and bottomland hardwood-yellow pine were determined (forest type codes 12, 13, 31, 32, and 46). Regeneration, seedling-sapling, and sparse stand acreage was subtracted from the total as these areas have little chance of sustaining large losses to SPB.

- Green tree:red tree ratio

  This ratio, based on the number of green infested trees to the number of red and fading infested trees, provides an indication of how rapidly a SPB spot is expanding at the time of ground check.

  The Arkansas model developed by Dr. Fred Stephen at the University of Arkansas was used to predict additional spot growth. This was done for 12 of the spots that were sampled.

  The number of SPB spots predicted to have additional timber loss and the size of this loss are used to provide an indication of whether SPB losses will continue. A large number of SPB spots can be relatively unimportant if projected losses are small. Conversely, a few rapidly expanding SPB spots can cause tremendous timber losses.

- Volume of timber currently infested and economic evaluation.

  The volume of timber currently infested is calculated from the ground checked SPB spots. The currently infested volume is used in the Southern Pine Beetle Economic Evaluation Program (SPBEEP) to develop the economic benefit cost ratio, internal rate of return, targets for timber removed, and the volume of timber protected by control efforts. As the volume of timber currently infested with SPB increases, the economic benefits from a SPB suppression project also increase.

- Entomological judgment

  Professional experience and field observations from the ground checked spots are used to interpret and supplement the technical data to reach a final decision.

RESULTS AND DISCUSSION

A total of 190 active multiple tree SPB infestations were recorded during the aerial survey. Forty-five spots were ground checked by FPM during the evaluation and the data are summarized in table 1. The ground checked spots ranged in size from 3-268 trees and the mean ratio of green infested:red infested trees was 2.1:1. Most of the spots were expanding and contained many trees with fresh attacks. Figure 1 shows the area of heaviest SPB activity. There is a total of 211,939 acres of susceptible host type for all the Ouachita National Forest Districts which were evaluated. There is a mean of 0.88 spots/1000 acres of susceptible host type.

Trend

Of the 45 spots ground checked, all but 12 have a positive green to red infested ratio (table 1). Three of these spots (green:red of <1) which were analyzed by the Arkansas spot growth model, exhibited spot

Fig. 1. Areas of SPB infestation on the Ouachita National Forest.

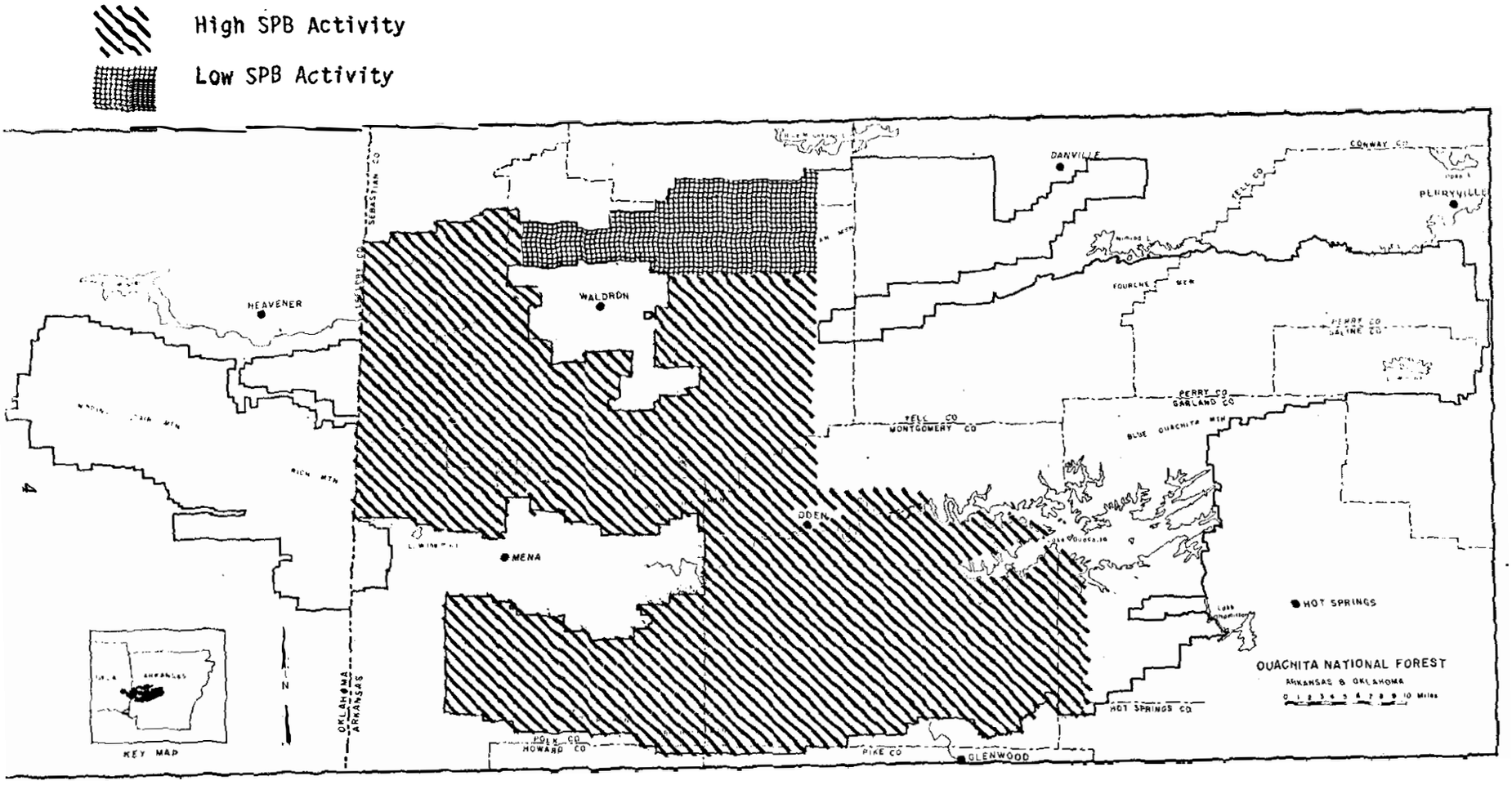

Table 1. Summary of ground check data fore the Poteau, Caddo, Mena, Womble, and Oden Districts of the Ouachita National Forest.

District	# SPB spots>5 trees (aerial observation	# SPB spots ground checked	Total spot size	Infested trees	Red and fading infested trees	Green infested trees	Green to red tree ratio	Projected SPB spot growth in 30 days (Stephens model)		Maximum spot growth ratio	Pine basal area
								Min.	Max.		
Mena	26	(5)									
		1.	29	27	9	18	1:2.00	56	76	2.81	70
		2.	96	75	25	50	1:2.00	151	201	2.68	80
		3.	5	0	-	-	-	-	-	-	80
		4.	71	54	16	38	1:2.38	-	-	-	90
		5.	31	15	9	6	1:0.67	28	38	2.53	100
Oden	50	(10)									
		1.	111	74	34	40	1:1.18	163	217	2.95	100
		2.	3	3	2	1	1:0.50	-	-	-	70
		3.	5	4	4	0	4X	-	-	-	90
		4.	133	118	28	90	1:3.21	-	-	-	160
		5.	268	193	67	126	1:1.88	-	-	-	100
		6.	78	29	10	19	1:1.90	-	-	-	140
		7.	21	3	3	0	3X	-	-	-	80
		8.	146	91	16	75	1:4.69	-	-	-	140
		9.	55	34	23	11	1:0.48	-	-	-	130
		10.	37	33	6	27	1:4.50	-	-	-	70

Table 1. Continued.

District	# SPB spots>5 trees (aerial observation	# SPB spots ground checked	Total spot size	Infested trees	Red and fading infested trees	Green infested trees	Red to green tree ratio	Projected SPB spot growth in 30 days (Stephens model, infested trees) Min. - Max.	Maximum spot growth ratio	Pine basal area
Caddo	21	(5)								
		1.	179.0	138	16	119	1:7.44	-	-	130
		2.	9	3	-	3	1:3.00	-	-	100
		3.	96	49	24	20	1:0.83	114-152	3.10	120
		4.	51	41	17	24	1:1.41	82-110	2.68	90
		5.	28	18	9	9	1:1.00	43-59	3.28	120
Cold Springs	25	(4)								
		1.	5	2	1	1	1:1.00	-	-	70
		2.	110	76	24	52	1:2.17	-	-	75
		3.	19	2	0	2	1:2.00	-	-	110
		4.	232	129	52	77	1:1.48	-	-	80

Table 1. Continued.

District	# SPB spots>5 trees (aerial observation	# SPB spots ground checked	Total spot size	Infested trees	Red and fading infested trees	Green infested trees	Green to red tree ratio	Projected SPB spot growth in 30 days (Stephens model, infested trees)		Maximum spot growth ratio	Pine basal area
								Min.	Max.		
Poteau	35	(10)									
		1.	21	18	4	14	1:3.50	-	-	-	140
		2.	4	2	1	1	1:1.00	-	-	-	150
		3.	12	12	11	1	1:0.09	-	-	-	100
		4.	88	83	33	50	1:1.52	-	-	-	110
		5.	41	25	16	9	1:0.56	-	-	-	100
		7.	81	62	20	42	1:2.10	-	-	-	120
		7.	19	16	9	7	1:0.78	-	-	-	90
		8.	151	120	21	99	1:4.71	237	315	1:2.63	90
		9.	209	142	49	93	1:1.90	-	-	-	130
		10.	176	112	30	82	1:2.73	184	244	1:2.18	80
		11.	9	8	7	1	1:0.14	8	12	1:1.50	90

Table 1. Continued.

District	# SPB spots>5 trees (aerial observation	# SPB spots ground checked	Total spot size	Infested trees	Red and fading infested trees	Green infested trees	Green to red tree ratio	Projected SPB spot growth in 30 days (Stephens model) Min.	Max.	Maximum spot growth ratio	Pine basal area
Womble	33	(10)									
		1.	66	52	7	45	1:6.43	-	-	-	110
		2.	23	2	-	2	:2X	-	-	-	90
		3.	13	-	-	-	-	-	-	-	60
		4.	32	26	5	21	1:4.20	-	-	-	50
		5.	8	4	1	3	1:3.00	-	-	-	90
		6.	60	42	9	33	1:3.67	-	-	-	90
		7.	18	9	4	5	1:1.25	-	-	-	100
		8.	47	30	12	18	1:1.50	71	95	1:3.17	110
		9.	25	21	5	16	1:3.20	43	57	1:2.71	90
		10.	14	2	-	2	:2X	-	-	-	110

growth ratios of 3.1, 2.53, and 1.5, respectively. This indicates that even the spots with a green to red infested tree ratio of less than one are expected to continue growing at a high rate.

Of the SPB spots, for which the Arkansas model predicted growth, the least amount of growth (30 days) was 1.50 times the number of infested trees found during ground checking. The highest infested tree growth ratio predicted was 3.28 times the amount of infested trees at the time of ground checking. The spots for which the Arkansas model predicted growth ranged from 9 to 176 total trees.

The number of SPB spots found on both the Mena and the Caddo are reduced from what was found one year ago. These numbers seem to indicate a declining population, but the spots ground checked on these districts (Mena and Caddo) were growing as fast as those found on the other districts. The SPB salvage program has been pursued by the Mena and Caddo Districts for the last year. One result of this program is less SPB spots. This does not affect the size of the spots that do occur, however, as this is related more to stand conditions than control efforts. The Oden, Poteau, and Womble Districts have the greatest potential for losses based on spot growth and numbers of spots found.

Arkansas, in general, had a wet spring and is experiencing a very dry summer. Craighead, in 1925, associated rainfall deficiency in late summer and fall with epidemic outbreaks of SPB.

Economic Analysis

The estimated volume of trees currently infested is 3,249.5 MBF. If a SPB suppression project were undertaken, it is estimated that 1,463 MBF would be removed and 5,293 MBF would be protected. The volume lost without a suppression project would be 1,950 MBF and with a suppression project 487 MBF. For detailed information on the economic benefits with and without a project refer to Appendix I.

Hazard Rating

All 45 of the ground checked infestations were hazard rated (table 2). Nineteen stands were in the high classification, 17 in the medium classification and 9 in the low classification.

A hazard rating analysis of all stands on each district shows that each district has a small percentage of high and medium classification acres (table 3).

The small acreage in the high and medium class categories shows that the districts have less highly susceptible timber than some other forests in Region 8. This also shows that once the SPB populations increase, most timber is susceptible to being attacked.

Trees on the Ouachita National Forest are stressed due to drought and the stress is readily observable. Little or no pitch flow in response to SPB attack was noticed on all sample spots. Hardwood trees were beginning to enter dormancy early as evidenced by browning foliage. Some oaks were dead due to drought. The weather stress has contributed to the SPB outbreak and the SPB population is now at a stage where further expansion is probable for this fall and into FY 1984.

RECOMMENDATIONS

Based on the size and number of new spots found this August, the ratio of green to red infested tres, and the predictions by the Arkansas model for further losses, FPM anticipates continued SPB losses in FY 1984 and recommends a suppression project be continued on the Caddo and Mena Districts and initiated on the Poteau, Oden, and Womble Districts. The Cold Springs District had insufficent numbers of spots and spot growth to warrant a suppression project. A detailed description of control alternatives is presented in Appendix II. (Note: Cut-and-leave used alone is not an effective treatment for SPB from October through April.)

Control efforts will be hampered by accessibility of the SPB spots and by market conditions. For this suppression project, it will be necessary to plan both cut-and-leave and cut-and-spray treatments for the SPB.

Personnel working in the field are encouraged to keep up the surveillance efforts during the winter months, since control at this time slows the spread of SPB and initiation of new spots in the spring.

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APPENDIX I

Table 4. Southern Pine beetle economic evaluation for the Caddo, Mena, Oden, Womble, and Poteau Districts at 4% discount rate.

WITHOUT A PROJECT

AGE	HARV OBJ.	VOLUME LOST (MBF)	SPOT GROWTH RATE	VOLUME THREAT (MBF)	GROWTH RATE (%)	AGE AT HARV.	VOLUME AT HARVEST (MBF)	PRICE AT HARV.	VALUE AT HARVEST	PRESENT VALUE
50	S/F	390	3.62	1411	1.0	70	1725	$ 200	$ 344991	$ 151394
70	S/F	1560	3.62	5646	.6	70	5680	$ 200	$ 1135943	$ 1092253
TOTAL		1950		7057			7405		$ 1480934	$ 1243647

VALUE OF THE VOLUME NOT SALVAGED (LOST) $ 126728

TOTAL VALUE LOST $ 1370375

WITH A PROJECT

AGE	HARV OBJ.	VOLUME LOST (MBF)	SPOT GROWTH RATE	VOLUME THREAT (MBF)	GROWTH RATE (%)	AGE AT HARV.	VOLUME AT HARVEST (MBF)	PRICE AT HARV.	VALUE AT HARVEST	PRESENT VALUE
50	S/F	97	3.62	353	1.0	70	431	$ 200	$ 86248	$ 37848
70	S/F	390	3.62	1412	.6	70	1420	$ 200	$ 283986	$ 273063
TOTAL		487		1764			1851		$ 370234	$ 310912

VALUE OF THE VOLUME NOT SALVAGED (LOST) $ 31682

TOTAL VALUE LOST $ 342594

PROJECT BENEFITS:	1027781
TOTAL PROJECT COST:	50000
NET PRESENT VALUE:	977781
BENEFIT COST RATIO:	20.56
INTERNAL RATE OF RETURN:	> 400%
COMPOSITE RATE OF RETURN:	20.10%
TARGETS	
VOLUME REMOVED:	2762
VOLUME PROTECTED:	5293

Table 5. Southern pine beetle economic evaluation for the Caddo, Mena, Oden, Womble, and Poteau Districts at 7.375% discount rate.

WITHOUT A PROJECT

AGE	HARV OBJ.	VOLUME LOST (MBF)	SPOT GROWTH RATE	VOLUME THREAT (MBF)	GROWTH RATE (%)	AGE AT HARV.	VOLUME AT HARVEST (MBF)	PRICE AT HARV.	VALUE AT HARVEST	PRESENT VALUE
50	S/F	390	3.62	1411	1.0	70	1725	$ 200	$ 344991	$ 77418
70	S/F	1560	3.62	5646	.6	70	5680	$ 200	$ 1135943	$ 1057922
TOTAL		1950		7057			7405		$ 1480934	$ 1135339

VALUE OF THE VOLUME NOT SALVAGED (LOST) $ 126728

TOTAL VALUE LOST $ 1262068

WITH A PROJECT

AGE	HARV OBJ.	VOLUME LOST (MBF)	SPOT GROWTH RATE	VOLUME THREAT (MBF)	GROWTH RATE (%)	AGE AT HARV.	VOLUME AT HARVEST (MBF)	PRICE AT HARV.	VALUE AT HARVEST	PRESENT VALUE
50	S/F	97	3.62	353	1.0	70	431	$ 200	$ 86248	$ 19354
70	S/F	390	3.62	1412	.6	70	1420	$ 200	$ 283986	$ 264480
TOTAL		487		1764			1851		$ 370234	$ 283835

VALUE OF THE VOLUME NOT SALVAGED (LOST) $ 31682

TOTAL VALUE LOST $ 315517

PROJECT BENEFITS:	946551
TOTAL PROJECT COST:	50000
NET PRESENT VALUE:	896551
BENEFIT COST RATIO:	18.93
INTERNAL RATE OF RETURN:	> 400%
COMPOSITE RATE OF RETURN:	23.52%
TARGETS	
VOLUME REMOVED:	2762
VOLUME PROTECTED:	5293

APPENDIX II

ALTERNATIVES FOR SOUTHERN PINE BEETLE CONTROL

Four alternatives are recommended for southern pine beetle control. The following discussion briefly outlines these alternatives (Swain & Remion 1980). For a more detailed description on conducting control procedures in a southern pine beetle suppression project refer to the Project Control Plan.

Alternative 1. Remove trees through salvage.

Salvage is the method most often used for stopping the growth of existing spots. This strategy involves removing a buffer strip of noninfested trees, all green infested and red infested trees, and if desired, the trees already killed by the beetles. Costs associated with removing uninfested trees are not charged to specifically designated SPB Project Control Funds since removing uninfested material is not needed for successful control even though it may be operationally desirable. The buffer strip should surround the recently attacked trees. It should be 40 to 70 feet wide for most active spots, while a 100-ft strip (and occasionally larger) may be needed for large, rapidly expanding spots. As a rule, the width of the buffer should not exceed the average height of the trees in the spot. The SPB spot should be carefully surveyed and all trees to be removed should be marked.

To implement this alternative the buffer strip should be cut first. All infested trees should then be cut. Vacated trees are cut last and are removed only for utilization purposes. All trees should be felled toward the center of the spot. The reason for this is to keep infested trees as far away from noninfested trees as possible. This reduces the chance of beetles killing additional trees.

Alternative 2. Piling and burning.

Unmerchantable or inaccessible southern pine beetle infestations can be suppressed by cutting, piling, and thoroughly charring the bark of infested trees. The entire bark surface must be thoroughly charred to insure effective control. The order of priority for cutting, piling, and burning infested trees, particularly in large spots, is the same for Alternative 1. Cutting a buffer strip is not recommended. To reduce the possibility of "breakouts", every effort should be made to locate and treat all green infested trees during the piling and burning operation.

Alternative 3. Cut-and-leave infested trees.

This is accomplished by felling a buffer strip and all infested trees toward the center of the spot. The purpose is to stop spot growth. Use of this method causes beetles to disperse at a time of year when this behavior is unnatural. This results in a reduction of mass attacked trees and spot growth ceases. Cut-and-leave should only be

used in the summer (May 1 - September 30), since these are the only months beetles are not dispersing. It should only be used on small spots, normally 50 infested trees or less.

Alternative 4. Chemically treat infested trees.

In this method, infested trees are felled toward the center of the spot, cut into workable lengths, and sprayed with lindane or Dursban® 4E. The purpose of this method is to kill the beetle population. To be effective, all bark surfaces must be sprayed. This involves turning the logs which becomes more difficult as tree size increases.

Forest Pest Management, Alexandria Field Office, Pineville, LA, should be contacted prior to the extensive use of chemical control for an update on latest restrictions or application procedures.

PRECAUTIONARY STATEMENT

Pesticides used improperly can be injurious to man, animals, and plants. Follow the directions and heed all precautions on the labels.

Store pesticides in their original containers under lock and key out of reach of children and animals, and away from food and feed.

Apply pesticides so that they do not endanger humans, livestock, crops, beneficial insects, fish and wildlife. Do not apply pesticides when there is danger of drift, when honey bees or other pollinating insects are visiting plants, or in ways that may contaminate water or leave illegal residues.

Avoid prolonged inhalation of pesticide sprays or dusts; wear appropriate protective clothing.

If your hands become contaminated with a pesticide, wash them immediately with soap and water. In case a pesticide is swallowed or gets in the eyes, follow the first aid treatment given on the label and get prompt medical attention. If a pesticide is spilled on your skin or clothing, remove the clothing immediately and wash skin thoroughly. After handling or spraying pesticides, do not eat or drink until you have washed with soap and water.

Do not clean spray equipment or dump excess spray material near ponds, streams, or wells. Because it is difficult to remove all traces of herbicide from equipment, do not use the same equipment for insecticides or fungicides that you used for herbicides.

Dispose of empty pesticide containers promptly. Have them buried at a sanitary landfill dump, or crush and bury them in a level, isolated place.

NOTE: Some states have restrictions on the use of certain pesticides. Check your state and local regulations. Also, because registrations of pesticides are under constant review by the U.S. Environmental Protection Agency, consult your county agent, state extension specialist or FPM to be sure it is still registered for the intended use. For further information or assistance, contact Forest Pest Management, Alexandria Field Office, Pineville, La., 71360, (Telephone: FTS 497-7280, or Commercial 318/473-7280).